

# Release A CDR RID Report

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Section

Page

Figure Table

Category Name MSS Design

Actionee Project (Folts)

Sub Category Project

Subject Enterprise Networks and System Management Architecture

## Description of Problem or Suggestion:

In CSMS CDR documents and presentations, it has been mentioned that MSS will provide an Enterprise network and system management for all ECS resources. An overall cooperative enterprise management interdomain architecture and operations concept is needed to reduce the overall development and equipment cost, improve operational robustness, and to promote the compatibility with evolving industry and government standards. In the absence of such an enterprise management operations concept, it is difficult to review and verify the MSS design. The enterprise management architecture and operations concepts have not been described anywhere from the viewpoint of how the enterprise management architecture will be implemented. It is not described anywhere how the following items are being addressed by the management architecture:

\* What individually controlled and managed domains within ECS and other extended EOSDIS elements are being covered by the enterprise management architecture. The external entities or domains that need to be part of the enterprise management from the view point of coordination and exchange of shared management information include EDOS, EBnet, PSCN, VO, TSDIS, NOAA, NSI, and many other secondary systems within the overall EOSDIS Ground System (EGS).

\* Manager-to-agent (SMC to DAACs) and peer-to-peer (such as DAAC to DAAC, SMC-to-EDOS, SMC-to-EBnet, SMC to NSI NOC etc) interactions, coordination and cooperation to share management information to resolve problems as an integrated system.

\* Single-point-of-contact based help desk structure with an interdomain

## Originator's Recommendation

Working with representatives from the various EOSDIS domains, develop a total EOSDIS cooperative enterprise management architecture and operations concept. This should include definition of the enterprise processes to be supported and shared knowledge required between domains to ensure effective overall operation of EOSDIS. Identify any functionality currently missing from EGS that would be needed to implement the enterprise management concept.

GSFC Response by: Hal Folts

GSFC Response Date 9/29/95

EOSDIS ENTERPRISE MANAGEMENT CONCEPT DEVELOPMENT TASK

## PURPOSE

The Earth Observing System Data and Information System (EOSDIS) is comprised of many subsystems, or component systems, that must function efficiently and in harmony to fulfill the total enterprise mission as a fully integrated system. This paper has been prepared to outline the basic concepts for effective integrated enterprise management operations. As a brief presentation of the concept principles, the paper is intended to serve as the basis for further discussion and development of a fully cooperative network and systems management capability for EOSDIS.

## BACKGROUND

Standards and technology are rapidly maturing in industry for automating critical network and systems management processes. This enables the establishment of comprehensive enterprise-wide management capabilities of fully integrated system elements. Management capabilities traditionally have been focused on specific systems, such as LANs, router subnetworks, switched subnetworks, processing systems, and self-contained administrative domains. All component systems of an enterprise may be under control of a single administration within one domain, or they may be multiple individual domains that contain the operational resources in supporting the enterprise. The latest technologies for cooperative management now allow establishment of a totally integrated management concept while leaving control, maintenance, and operations within the purview of individual component systems or operational domains. The emerging electronic bonding technology provides the direct on-line communication of operational event information. The concept of shared knowledge defines the critical data that needs to be interchanged among

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under control of a single administration within one domain, or they may be multiple individual domains that contain the operational resources in supporting the enterprise. The latest technologies for cooperative management now allow establishment of a totally integrated management concept while leaving control, maintenance, and operations within the purview of individual component systems or operational domains. The emerging electronic bonding technology provides the direct on-line communication of operational event information. The concept of shared knowledge defines the critical data that needs to be interchanged among cooperating domains for effective management operations without overloading the system with a flood of superfluous data. The integration of distributed systems is achieved through providing cooperative visibility among operational domains for coordinating events and facilitating timely trouble resolution and other management operations. On-line coupling of individual component systems for interaction and sharing knowledge enables an enterprise management function to maintain coherence of operations and traceability of activities. Correlation of events rapidly facilitates isolation of faults, reduces redundancy of actions, and keeps the total system functioning within design parameters. The Enterprise Management Concept (EMC) is not a function of centralized control, but monitors the pulse of enterprise operations and ensures that the required level of operational performance is maintained.

## EOSDIS ENVIRONMENT

Within EOSDIS there are many domains of operation and responsibility that must function together as the total system in support of NASA's Mission to Planet Earth. These include the DAACs, EDOS, ECS, EBnet, NSI, campus LANs, PSCN, FTS2000, and commercial carriers. Each of these can be considered as component systems in separate administrative domains. Some of these domains may also be serving other operational functions in addition to EOSDIS. However, they must all function together in harmony efficiently and effectively as one system in support of the EOSDIS mission.

Currently, the management functions of the different component systems (used as a generic term for the various operating domains of EOSDIS) are a loose confederation of individual management capabilities. For example, each of the EOSDIS component systems has its own local management system (LMS). In addition, the ECS has an overall SMC function specified. This was known as the Systems Management Center, but has been more recently been referred to as System Monitoring and Coordination center to reflect the spirit of cooperative management. The SMC has the responsibility for management of processing resources and inter-DAAC data flows of the ECS. From this foundation of distributed network and systems management functions of the component systems, an EOSDIS integrated management and operations concept would reap the many benefits of the richness of cooperative management technology to ensure the optimization of overall system performance.

## ENHANCED CONCEPT

Establishment of an integrated Enterprise Management Concept (EMC) for EOSDIS will contribute significantly to the success of the program. It is complementary to SMC functionality and will define the management processes to be fulfilled, the interdomain electronic bonding, and the shared knowledge required.

The EMC will establish clear visibility among the component systems to provide the shared knowledge of operational status of the resources and assess operational performance. These data can be analyzed on a continuing basis to identify potential failures, isolate faults, and evaluate performance of operations. A coherent trouble administration capability will provide a quick response for problem resolution. Multiple events, e.g. alarms, will be correlated to pinpoint specific problems and minimize a flood of redundant trouble tickets, or calls, from many users affected across multiple domains by a single failure.

An effective trouble ticket system, electronically bonded with all component systems, will provide the mechanism to coordinate problem resolution among the component systems. Trouble tickets can be initiated as soon as a problem is identified and advised to other points within the enterprise that may be impacted. Shared knowledge of actions underway can facilitate further correlation and elimination of redundant trouble tickets being issued. Many problems will be in resolution before users alert the help desk. An integrated trouble ticket system will further enable interaction between component systems during the isolation and correction of faults. A coherent, enterprise-wide, trouble administration system will significantly speed correction of problems, maintain traceability of actions underway, and be responsive to the EOSDIS user community.

## THE TECHNOLOGY

The technology for network and systems management applications is maturing rapidly to provide the advanced capabilities for enterprise management automation. A number of standards and industry agreements have been established. Some are considered competing alternatives, such as SNMP and CMIP, but each has an appropriate area of application and can coexist in a properly integrated enterprise management system. Enterprise management technology consists of many different pieces initially available and will evolve to a consistent and comprehensive capability. The important issues that must be considered in the establishment of an enterprise management system are depth of functionality required to support planned operations initially and in the future, the distributed database structure, interchange protocols, data formats and schema, and the intelligence needed in the managed network elements.

The standards for trouble tickets and electronic bonding for interchange of information among administrative domains have been agreed upon through both the formal standards process and industry consortia. Testing of implementations is currently being conducted within the commercial carrier community. The Defense Information Systems Agency (DISA) is prototyping an electronic bonding implementation for demonstration in December 1995 to provide direct trouble ticket interchange with commercial carriers. This provides a scheme that will enable interchange of trouble tickets between different administrative domains and among different levels of operational areas within the same administrative domain. The interface defines a common data structure and procedures for interchange of data between trouble administration systems using different schema through a gateway function. The data structure may also serve as the basis for a common schema design of new implementations to establish the thread of

The Network Management Forum (NMF) is aggressively defining the processes for automating trouble administration between users and service providers. The NMF, in cooperation with the formal standards bodies and other industry consortia, are further expanding the electronic bonding capability to include on-line provisioning and performance reporting. The NMF work will continue

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These industry standards provide the basis for interoperability among component systems. They do not remove the responsibility or administrative prerogatives of individual administrative domains for operation and maintenance of their resources. However, the component systems will function in coordinated harmony to fulfill the enterprise mission.

## **THE PROPOSED PLAN OF ACTION**

Using this paper as the launching point for further development of a total enterprise management and operations concept for EOSDIS, work can proceed to refine the issues and solutions for implementation on a timely basis.

The EMC should define the overall framework for EOSDIS integrated cooperative management activities. The EMC may be a virtual function that is distributed or could be an enhancement to the SMC.

Many issues have to be addressed. The legacy of the existing provisions of the SMC and local management facilities of each domain need to be summarized to serve as a baseline to build upon. The management processes that are desired from the overall enterprise level need to be defined. This will identify the functionality needed to ensure that EOSDIS is optimally fulfilling its mission.

The level of visibility that the EMC provides among the component systems needs to be defined. The initial functional areas to be addressed are:

1. Trouble Administration - Fault Management
2. Performance Assessment (including accountability, e.g. usage patterns) - Performance Management

Additional functional areas should also be explored as the work proceeds. However, these two initial areas can now be supported by maturing technology and prototyping efforts.

Data required for shared knowledge of major-alarm status and operational-performance statistics needs to be defined. The ability of operational elements to fulfill enterprise, network, and systems management functionality and provide the required data needs to be identified or defined. A fully integrated trouble ticket system that is electronically bonded among all the EOSDIS component systems needs to be established with common schema to facilitate interoperability.

The resolution of these issues and solidifying a comprehensive enterprise management and operational concept must result from a cooperative effort of all the interests involved in EOSDIS. Therefore, it is proposed to establish an EMC Development Team with representation from each EOSDIS component domain. The Team should endeavor to produce an initial proposal that will serve as the vision for future realization. The EMC would then be used as direction to influence design decisions being made for earlier releases and become effective subsequent to Release B. Work can then continue by the EMC Development Team to refine the concept and flesh out details.

The specific agenda for the Team should include:

1. Kick-off meeting to introduce issues, views, and set work plan - October 11.
2. Summarize legacy functionality and specifications - October 18.
3. Identify the management operations that are required.
4. Define the management processes to be fulfilled - November 1.
5. Define the shared knowledge requirements - November 8.
6. Identify/define capabilities of operational elements to provide data - November 15.
7. Identify the interdomain interface/gateway requirements - November 15
8. Publish initial report for review - November 30

While this is a very ambitious schedule, the first effort should produce the basic foundation for the EMC. Then a continuing effort can focus on more detail and additional functional areas.

## **IN CONCLUSION**

This paper introduces many considerations for bringing forth a fully integrated enterprise management and operations concept for fulfilling the total EOSDIS mission effectively. Only a few elements of the rich technology that is emerging for automation of network and systems management functionality have been touched. The items outlined above bring in a sound initial basis to set the foundation for an ongoing evolution toward expanded comprehensive capabilities as system operations demand and as financial resources will support. This will provide the beginning of the "yellow brick road" for evolution aimed at advancing cooperative management technology and functional richness for integrated enterprise management applications. With cooperative participation from each of the EOSDIS domains, a sound consensus will be reached that will provide the required framework for fully effective enterprise management of EOSDIS.

**HAIS Response by:**

**HAIS Schedule**

**HAIS R. E.**

**HAIS Response Date**

HAIS R. E.

HAIS Schedule  
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~~HAIS Response Date~~

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\*\*\*\*\* Attachment if any \*\*\*\*\*

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